achieve. Consequently, it will be extremely difficult, if not impossible to achieve reproducible assay results with such a device. Time-consuming chemical reactions sensitive to ultrasonic energy may not be reproducible at all. In addition, the use by Sizto et al. of a liquid bath ultrasonic cleaner device presents an unnecessary risk of cross-contamination between the bath and the assay medium. Such contamination is likely to cause erroneous assay results.

[0011] Further, an apparatus according to Sizto et al. is not particularly suited to commercial application. As a consequence of designedly incorporating a liquid bath, the apparatus of Sizto et al. is relatively large, cumbersome and heavy and consumes considerable electrical power. Such power is required because of the wasteful dissipation of ultrasonic energy in the bath shell, bath liquid, and assay container. Clearly, a device according to Sizto et al. very inefficiently transmits ultrasonic energy to an assay medium in a container and from there to a binding surface. Moreover, the use of an ultrasonication bath is an additional complicated assay step requiring skillful manipulation by a user. As such, an ultrasonication bath is not suitable for use in an integrated, automated assay system or for use by assay technicians that are not highly skilled. Disadvantageously, the ultrasonication bath of Sizto et al. cannot be incorporated into an assay device or assay system that is small, robust, inexpensive, easy to use. The ultrasonication bath would also not be suitable for a disposable device.

[0012] Many assay techniques detect the binding of molecules in solution to reagents located at a solid phase. The binding of molecules to reagents on a solid phase can be measured directly, for example, by surface plasmon resonance. Alternatively, by attaching a label to a molecule in solution, the binding of the molecule to a surface can be determined by measuring the amount of label located on the surface. Typical labels used in assays include enzymes, fluorescent molecules, radioactive isotopes, chemiluminescent molecules, electroactive molecules, and colloidal particles. For more description of the field, the reader is referred to *Nonradioactive Labeling and Detection of Molecules*, Kessler, C., ed., Springer-Verlag, Berlin 1992; *The Immunoassay Handbook*, Wild, D., ed., Stackton Press, New York 1994; and Keller, G. H.; Manak, M. M. *DNA Probes,* 2nd Ed., MacMillan Publishers Ltd., London, 1993.

[0013] One particularly useful detection technique is electrochemiluminescence (ECL). In ECL, electron transfer reactions at or near an electrode causes a label to adopt an electronically excited state. The excitation level of the label decays through emission of a photon which can be photometrically detected. Derivatives of ruthenium tris-bipyridyl (TAG1) are widely used as ECL labels. Further details regarding ECL detection techniques can be found in Bard et al. (U.S. Pat. No. 5,238,808) and Knight et al., 1994, Analyst, 119:879-890. While ECL monitoring of binding reactions in solution has been described, it is noted that a wide variety of ECL-based binding assays utilize binding reagents located on a solid-phase support. For example, the solid-phase support may consist of a magnetic bead that is deposited on an electrode surface (published PCT WO 92/14138 and Yang, H.; Leland, J.; Yost, D. Massey, R.; Bio/Technology 12 (1994) 193-194). Alternatively, an electrode (e.g., a fibril-polymer composite electrode) may be derivatized so as to provide a solid-phase support, for example, as described in copending U.S. application Ser. No. _____ filed on even date herewith, and PCT Application No. _____ (WO _____) filed on even date herewith, both of which are incorporated by reference above.

OBJECTS AND SUMMARY OF THE INVENTION

[0014] Therefore, an object of the present invention is to provide apparatus and methodology for increasing the speed of diagnostic testing processes.

[0015] Another object of the present invention is to provide sonication apparatus and methodology avoiding the disadvantages suffered by the prior art and increasing the speed of diagnostic testing processes.

[0016] Yet another object of the present invention is to provide apparatus for sonicating an assay cell or cartridge used in an electrochemiluminescence assay.

[0017] According to an aspect of the present invention, an apparatus for use in carrying out electrochemiluminescence measurements is provided. The apparatus comprises a cell that includes a working electrode, a sonicating device, structurally coupled to the cell, for sonicating the contents of the cell.

[0018] According to an aspect of the present invention, an apparatus for use in carrying out electrochemiluminescence measurements is provided. The apparatus includes a cell that includes a working electrode. The apparatus also includes a sonicating device, structurally coupled to the working electrode, for increasing the rate of mass transport of molecules to and/or from the surface of the working electrode.

[0019] According to another aspect of the present invention, an apparatus for use in carrying out electrochemiluminescence measurements is provided. The apparatus includes a cell that includes a working electrode, wherein the working electrode is a solid-phase support for binding reagents specific for an analyte of interest. The apparatus also includes a sonicating device, structurally coupled to the cell, for sonicating the contents of the cell.

[0020] According to another aspect of the present invention, an apparatus for use in carrying out a plurality of electrochemiluminescence measurements is provided. The apparatus includes a cell, that includes one or more working electrodes, wherein the one or more working electrodes are solid-phase supports for one or more binding domains. The one or more binding domains comprise binding reagents specific for one or more analytes of interest. The apparatus also includes a sonicating device, structurally coupled to the cell, for sonicating the contents of the cell.

[0021] According to another aspect of the present invention, an apparatus for use in carrying out electrochemiluminescence measurements is provided. The apparatus includes a cell, that includes a working electrode, and an ultrasonicating device, structurally coupled to the cell, for ultrasonicating the contents of the cell.

[0022] According to another aspect of the present invention, an apparatus for use in carrying out electrochemiluminescence is provided. The apparatus includes a cartridge comprising a working electrode, that is a solid-phase support for binding reagents specific for an analyte of interest. The apparatus also includes a cartridge reader that includes a receptacle for the cartridge, a device for correctly position-